भारतीय मानक
Indian Standard

IS 16008 (Part 2) : 2016

(Reaffirmed 2020)

कृषिवस्त्रादि — कृषि और बागवानी प्रयोजनों के लिए छाया जाल — विशिष्टि

भाग 2 मोनो फिलामेंट से निर्मित छाया जाल

(पहला पुनरीक्षण)

Agro Textiles — Shade Nets for Agriculture and Horticulture Purposes — Specification

Part 2 Shade Nets Made from Mono Filament Yarns

(First Revision)

ICS 59.080.70; 65.020.20

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Technical Textiles for Agro-tech Sectional Committee, TXD 35

FOREWORD

This Indian Standard (Part 2) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Technical Textiles for Agro-tech Sectional Committee had been approved by the Textile Division Council.

This standard was first published in 2012 and is being revised to include the following major changes:

a) Amendment No. 1 has been incorporated.
b) Test method for determining shading percentage has been modified.
c) Requirement for shading percentage has been modified.
d) Sampling and criteria for conformity has been modified.

Shade nets are being manufactured by tape yarn technology, mono filament technology or a combination of both the technologies. Shade nets manufactured by mono filament technology has an added advantage of higher breaking and bursting strength. Based on the manufacturing technology, this standard is published in two parts. The other Part in the series is:

Part 1 Shade nets made from tape yarns

The shade nets are mostly used for agriculture and horticulture applications particularly in countries like India where the scorching heat of the sun plays a major role in damaging the crops by sun burning and thus causing severe financial losses. The varying climatic conditions throughout the year, together with the slow but constant rising temperature in the summer months prove the need for shade nets to maximize growth and crop yields. The shade nets helps in controlling the temperature by accumulating the day heat to withstand the low temperatures of night thus help in off season ripening of fruits and vegetables. It also acts as a wind shield and prevents damage to young plants from damage.

The guidelines for installation of shade nets is given in Annex D for information only.

The composition of the Committee responsible for the formulation of this standard is given in Annex E.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AGRO TEXTILES — SHADE NETS FOR AGRICULTURE AND HORTICULTURE PURPOSES — SPECIFICATION

PART 2 SHADE NETS MADE FROM MONO FILAMENT YARNS

(First Revision)

1 SCOPE

This standard (Part 2) prescribes constructional and other performance requirements for synthetic agro shade nets manufactured from mono filament yarns for agriculture and horticulture purposes in protecting/ increasing crop yield by providing partially controlled climatic conditions for the intended crops.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 16366 and the following shall apply.

3.1 Shading Factor — It is the percentage of normally incident UV visible radiation in the range of 290 to 770 nanometer not transmitted by the shade nets.

3.2 Cover Factor — It is the area of shade nets covered by the yarn and fibre of the structure.

3.3 Photosynthetically Active Radiation (PAR) — It designates the spectral range (wave band) of solar radiation from 400 to 700 nanometer that photosynthetic organisms are able to use in the process of photosynthesis. PAR watts directly indicate how much light energy is available for plants to use in photosynthesis.

4 MATERIALS

4.1 HDPE Monofilament

Monofilament yarn shall be manufactured from HDPE granules, which shall be UV stabilized by adding suitable UV stabilizer. The linear density of the monofilament yarn shall be 33.33 tex (300 denier) for Type I and Type II shade nets and 55.55 tex (500 denier) for Type III and Type IV shade nets. As agreed to between the buyer and the seller, coloured monofilament yarn shall be manufactured using colour master batch. The denier of HDPE monofilament yarn used in the manufacture of shade nets shall be subjected to the following tolerances:

a) 10 percent on individual value; and
b) 5 percent on average.

4.1.1 The heat shrinkage of the monofilament yarn at 60°C shall not exceed 5 percent when subjected to the specified temperature for a period of 10 min in an air circulating oven. The heat shrinkage of the monofilament yarn at 95°C shall not exceed 8 percent when subjected to the specified temperature for a period of 10 min in hot water bath.

4.2 Fabric

The fabric used in the manufacture of mono filament yarn shade nets shall be knitted on the raschel knitting machines and shall have a width as per the agreement between the buyer and the seller. A tape of 1.70 ± 0.1 mm width or monofilament yarn of suitable diameter having the name of the manufacture and applicable shading percentage shall be provided at one end of the fabric which shall run through the complete length of the roll for identification of manufacture.

4.3 Colour

The colour or a mixture of colour of the shade nets fabric shall be as per the agreement between the buyer and the seller. The colour/shade shall be as specified in the contract or order. In case a sample has been agreed upon and sealed, the supply shall be made in conformity with the sample in such respects.

5 TYPES

Based on the shading percentage, the monofilament agro shade nets are classified as follows:

a) *Type I* — having shading percentage of 35 percent;
b) *Type II* — having shading percentage of 50 percent;
c) *Type III* — having shading percentage of 75 percent; and

d) *Type IV* — having shading percentage of 90 percent.

6 REQUIREMENTS

6.1 Dimensions and Mass

The monofilament shade nets shall be made to the shade and dimensions as specified in the contract or order. The dimensions shall be determined by the method prescribed in IS 1954. The following tolerance shall be permissible for length, width and mass (g/m^2):

Dimension	*Tolerance*, percent
Length	$^{+1}_{-0}$
Width	$^{+1}_{-0}$
Mass, g/m^2	$^{+6}_{-0}$

6.2 The monofilament shade nets fabric shall confirm to the requirements specified in Table 1.

7 PACKING AND MARKING

7.1 Packing

The monofilament shade nets shall be packed in roll form in length of 50 m or in bundle form or as agreed to between the buyer and the seller.

7.2 Marking

7.2.1 Each fabric roll/bundle shall be marked legibly by affixing a label with the following information:

a) Indication of the source of manufacture;
b) Type of shade nets and shading percentage;
c) Declared length and width of the shade nets;
d) Mass per square meter of the shade nets;
e) Batch No. and date of manufacture; and
f) Any other information desired by the buyer.

7.3 BIS Certification Marking

The nets may also be marked with the Standard Mark.

7.3.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and Rules and Regulations made thereunder. The details of the conditions under which a license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

8 SAMPLING

8.1 Lot

All monofilament shade nets rolls/bundles of same construction and type dispatched to a buyer against one dispatch note shall constitute a lot.

8.2 Unless otherwise agreed to between the buyer and the seller, the number of monofilament shade nets rolls/bundles to be selected at random from a lot shall be as given in col 3 of Table 2.

Table 1 Requirements of Shade Nets Made from Monofilament Yarns

(*Clause* 6.2)

Sl No.	**Characteristic(s)**	**Requirement(s)**				**Method of Test, Ref to**
		Type I	Type II	Type III	Type IV	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Mass, g/m^2, *Min*	95	125	310	460	IS 1964
ii)	Average breaking strength of shade nets fabric (Strip method, 325 mm × 50 mm test piece with gauge length of 200 mm), N, *Min*					IS 1969 (Part 1)
	a) Warpway	300	300	450	650	
	b) Weftway	350	620	1700	4300	
iii)	Retention of breaking strength after UV exposure, N, *Min*	←—— 85 percent of original actual value (fabric) ——→				Annex B and IS 1969 (Part 1)
iv)	Colour fastness to artificial light[1)]	4 or better	4 or better	4 or better	4 or better	IS 2454
v)	Bursting pressure, kgf/cm^2, *Min*	11	13	30	40	IS 1966 (Part 1) or IS 1966 (Part 2)
vi)	Shading percentage	30 to 40	45 to 55	70 to 80	85 to 95	Annex C

[1)] Applicable for coloured shade nets only.

Table 2 Scale of Sampling

(*Clause* 8.2)

Sl No.	No. of Rolls/ Bundles in Lot	Sample Size	Sub-sample Size	Permissible No. of Defective Rolls/Bundles
(1)	(2)	(3)	(4)	(5)
i)	Up to 50	3	2	0
ii)	51 to 150	5	2	0
iii)	151 to 300	8	3	1
iv)	301 to 500	13	5	2
v)	501 and above	20	5	3

9 NUMBER OF TEST SPECIMENS AND CRITERIA FOR CONFORMITY

Number of test specimens and criteria for conformity shall be as given in Table 3.

Table 3 Number of Test Specimens and Criteria for Conformity

(*Clause* 9)

Sl No.	Characteristic	No. of Rolls/ Bundles	Criteria for Conformity
(1)	(2)	(3)	(4)
i)	Material and manufacture, dimensions and mass	According to col 3 of Table 2	The defective rolls do not exceed the corresponding number given in col 5 of Table 2
ii)	All other requirements	According to col 4 of Table 2	All the test specimens shall pass the tests

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
1954 : 1990	Determination of length and width of woven fabrics — Methods (*second revision*)
1964 : 2001	Methods for determination of mass per unit length and mass per unit area of fabrics (*second revision*)
1966	Textiles — Bursting properties of fabrics — Determination of bursting strength and bursting distension:
(Part 1) : 2009	Hydraulic method (*second revision*)
(Part 2) : 2009	Pneumatic method (*second revision*)
1969 (Part 1) : 2009	Textiles — Tensile properties of fabrics — Determination of maximum force and elongation at maximum force: Part 1 Strip method (*third revision*)
2454 : 1985	Method for determination of color fastness of textile materials to artificial light (Xenon lamp) (*first revision*)
16366 : 2015	Glossary of terms used in agrotextile

ANNEX B

[*Table* 1, *Sl No.* (iii)]

UV RESISTANCE TEST

B-1 TEST SPECIMENS

The test specimens for breaking strength shall be cut from the sample as specified in IS 1969 (Part 1).

B-2 TEST CONDITIONS

B-2.1 The test shall be carried out with fluorescent UV-B lamp (313 nanometer or its equivalent).

B-2.2 The duration of the test shall be 144 h (that is 6 days).

B-2.3 The test cycle shall be 8 h at 60 ± 3°C with UV radiation alternating after 4 h at 50 ± 3°C with condensation.

B-2.4 Irradiation level throughout the test shall be maintained at $0.63^{+0.03}_{-0.0}$ W/m².

B-3 TEST PROCEDURE

B-3.1 Determine the original average breaking strength of shade nets specimens separately as per the test specified in IS 1969 (Part 1).

B-3.2 Expose the specimens alternately to ultraviolet light alone and to condensation in one respective cycle.

B-3.2.1 The type of fluorescent UV lamp, the timing of the UV exposure and the temperature of condensation shall be as specified in **B-2**.

B-3.3 Determine the average breaking strength of the specimens separately after UV exposure as mentioned above.

B-3.4 Determine the percent retention of original strength as follows:

$$\text{Percent retention of original breaking strength} = \frac{b}{a} \times 100$$

where

a = average breaking strength before UV exposure as obtained in **B-3.1**; and

b = average breaking strength after UV exposure as obtained in **B-3.3**.

NOTES

1 The UV source is an array of fluorescent lamps (with lamp emission concentrated in the UV range).

2 Condensation is produced by exposing the test surface to a heated, saturated mixture of air and water vapour, while the reverse side of the test specimen is exposed to the cooling influence of ambient room air.

ANNEX C

[*Table* 1, *Sl No.* (vi)]

TEST METHOD FOR DETERMINING SHADING PERCENTAGE OF SHADE NETS

C-1 PRINCIPLE

A sample of the shade nets is mounted in shade-O- meter tester and the amount of light transmitted or passed through the sample is measured with the help of PAR sensor, in W/m². The relative measurement of light transmission with and without sample is considered for calculating the shading percentage of shade nets.

C-2 SAMPLING

C-2.1 Laboratory Sample

For the laboratory sample take a swatch extending the full width of the product, of sufficient length along the selvage from each sample roll/bundle so that the requirements of **C-2.2** can be met.

C-2.2 Test Specimens

From the laboratory sample, cut at least 10 samples each having dimensions of 180 mm × 180 mm. Space the specimens along a diagonal on the unit of the laboratory sample. Take no specimens nearer the selvage or edge of the shade nets. The selected test specimens shall not have any creases or folds.

C-3 CONDITIONING

Bring the specimens to moisture equilibrium in the atmosphere for testing shade nets (65 ± 5 percent relative humidity and 27 ± 2°C temperature). Equilibrium is considered to have been reached when the increase in the mass of the specimen, in successive weightings made at intervals of not less than 2 h, does not exceed 0.1 percent of the mass of the specimen.

C-4 APPARATUS

The instrument used for measurement shall meet the geometric and spectral requirements. The schematic diagram of the apparatus is given in Fig. 1.

C-4.1 The shade-O-meter tester shall have a flat base with total approximate dimensions as given below:

Length × Diameter × Height = 970 mm × 350 mm × 325 mm

C-4.2 Apparatus shall consist of a chamber in which arrangement for placement of light source, filters, sample holder and sensor shall be provided. The inside surface of chamber shall be painted with black paint and shall be highly reflecting throughout the visible spectrum. The light transmitted through the shade nets sample shall be measured by light sensors.

C-4.3 The apparatus shall consist of the following elements:

a) *Light source* — Tungsten lamp which is an incandescent light bulb that has a tungsten filament shall be used in the apparatus to cater to visible light spectrum range. The light bulb of 60 W shall be used in the equipment.

b) *Filter* — Neutral density filters (ND) which exhibit nearly constant transmission, especially in the visible range shall be used in the apparatus. The filter shall be of 165 × 165 ± 2 mm size. The thickness of filters shall be 1 mm. The transmission of the filter shall be in the range of 400 to 700 nanometer wavelength.

c) *Specimen holder* — The specimen holder shall be 180 mm × 180 mm size with a tolerance of ± 2 mm with sample clamping holder on both the sides. Specimen holders shall be made of aluminium or stainless steel. The profile of sample holder shall be such that after mounting the specimen, exposed area of specimen shall be of diameter 150 mm with a tolerance of ± 2 mm.

d) *Measuring sensor* — Pyarnometer type light sensors which provide accurate, continuous measurement of PAR in the visible spectrum range of 400 to 700 nanometer wavelength shall be used in the apparatus. The amount of light transmitted through the sample is measured with these sensors.

NOTE — The PAR quantum sensors from *M/s Kipp and Zonen* (mention of the name of specific instrument is not intended to promote or give preference to the use of that instrument over others not mentioned) may be used in this kind of measurement.

C-5 TEST PROCEDURE

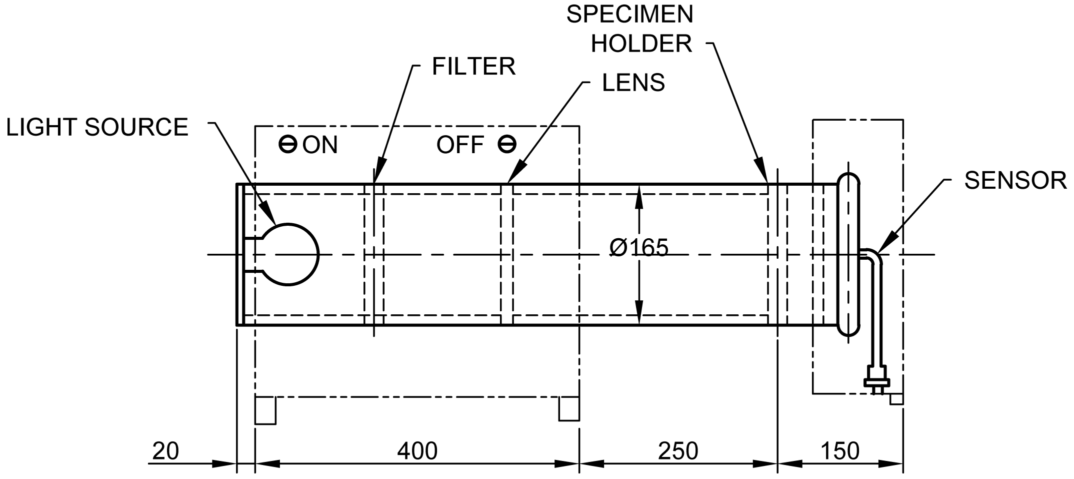
C-5.1 Instrument shall be switched on and the reading for PAR without sample shall be taken on the sensor. This shall be recorded as T_1.

C-5.2 Shade nets sample (*see* **C-2.2**) shall be mounted in the slot of specimen holder. The reading of PAR measurement with sample shall be taken from the sensor. This shall be recorded as T_2.

NOTE — Test specimen shall be properly mounted in the specimen holder so that it shall not be very tight or very lose in the specimen holder.

C-6 CALCULATION

C-6.1 Shading percentage shall be calculated from the following formula:



All dimensions in millimetres.

NOTE — The shade-O-meter has been designed and developed by *The Synthetic & Art Silk Mills Research Association*, Mumbai.

FIG. 1 SCHEMATIC DIAGRAM OF SHADE-O-METER

$$\text{Shading percentage} = \frac{T_1 - T_2}{T_1} \times 100$$

where

T_1 = reading of transmitted light, in W/m^2 (without sample); and

T_2 = reading of transmitted light, in W/m^2 (with sample).

C-6.2 Calculate the arithmetic mean of the measured values of shading percentage for ten samples.

ANNEX D

(*Foreword*)

INSTALLATION GUIDELINES FOR SHADE NETS

D-1 PREAMBLE

D-1.1 The primary function of agricultural shade nets is to provide favourable micro-climate to the plants by partially controlling the atmosphere and environment by reducing both light intensity and effective heat hence, round the year seasonal and off season cultivation is possible. This enables lengthening of the growing season and as well as flexibility of off season cultivation depending upon the conditions and the type of crop under shadenets house.

D-1.2 These shade nets are typically cladded on an inflated frame structure made out of materials such as G.I. pipes, steel, angle iron, wood or bamboo and is known as shadenets house in which crops are grown successfully. The success of shadenets house depends particularly on appropriate design, orientation, design loads, proper installation and the quality of materials used for its construction.

D-1.3 Shadenets house have proved to be highly useful, economical and effective in controlled environment agriculture and in meeting our requirements. It gives manifold production of good quality produce from the same piece of land as compared to the open cultivation.

D-1.4 The service life of shade nets over the structure depends purely on proper anchoring of shade nets with appropriate mechanism. It is very much essential to avoid joints/stitches of shade nets in between the frame structure. To achieve this proper onsite laying, joining and fixing of shade nets is imperative.

D-2 LOGISTICS

Shade nets are packed and transported by appropriate means so as to protect them from any type of damage. Rolls/bundles of shade nets are loaded manually or with a crane and tie beam and can be unloaded in a similar manner at the destination. Use of hooks shall be avoided for loading and unloading of the shade nets bundles/rolls at site.

D-3 STORAGE AT SITE

D-3.1 The shade nets shall be stored on levelled surface so as to protect them from any damage, dirt, grease, water, moisture, mud, mechanical abrasions or excessive heat and to be stacked not more than three rolls/bundles.

D-3.2 The owner of the site where the shade nets is to be installed shall provide storage space in a location sufficiently near the shade nets structure to minimize any additional handling.

D-3.3 The storage area shall be protected from theft, vandalism, vehicular traffic and any other source which could create potential damage to the shade nets.

D-4 PLANNING FOR A SHADENETS HOUSE

D-4.1 Before starting a shadenets house project, grower shall carefully study the climate and its influences on the growth of the crops intended to be grown. The following parameter need to be taken into consideration for its success:

a) Climate, soil and water, topography, accessibility of the area and the opportunities for transport and marketing, protection against fluctuating temperatures, solar radiation, heavy rain, hail and strong wind.

b) Type of soil, soil profile and the location. If possible, choose soil with a good structure in a flat area for the shadenets house project.

c) Adequate drainage of water to a lower area shall be ensured. It is very important to have enough and good irrigation water to irrigate and leach the soil.

d) A good infrastructure for transporting materials and products is also of importance, just like the availability of electricity.

D-4.2 Planning of Production

Planning of production to include what to plant, when to plant, how much to plant, how much it will cost, what quantities are required, where to sell, when to sell, who to sell, what price to sell at and how much it will cost. Market accessibility for selling the produce intended to be grown, if necessary, to switch to other crops is also an important factor.

D-4.3 After consideration of the above factors, size of the shadenets house need to be selected based upon the availability of the land, market access and experience of shadenets house cultivation. It is suggested that growers' to start with small sizes shadenets house as it would require less initial capital investment alongwith operational expenditure however, provision shall be made for future expansion also. Alongwith the above, experienced farmers/ entrepreneurs can decide on size of shadenets house depending upon their scale of operation and project costs. The cost may vary depending upon the types of shadenets house and number of suppliers' present in the region.

D-5 DESIGN CONSIDERATIONS

D-5.1 Site Selection

While selecting the site for construction of a shadenets house, the following points shall be considered for optimum growth and development of plant:

a) A shadenets house shall be located in such a way that it is well connected with market for input supplies and sale of its produce.
b) Structure shall be constructed away from buildings, trees, industrial and vehicular pollutants; means location shall be fairly shadow free.
c) Construction site shall be at higher elevation than surrounding land with adequate drainage facility.
d) Availability of good quality irrigation water and electricity for running of irrigation system.
e) *p*H of the soil should be in the range of 5.5 to 6.5 and electrical conductivity (EC) of 0.5 to 0.7 ms/cm, whereas *p*H of the irrigation water should be in the range of 5.5 to 7.0 and EC between 0.1 to 0.3 ms/cm.
f) For wind zone area, if possible, wind breakers may be located 30 m away from the shadenets structure.

D-5.2 Orientation

There are mainly two criteria for shade house orientation. They are: the uniformity of light intensity in the shade house and wind direction. Single span structure may be oriented either in east-west or north-south direction but multi span structure shall be oriented in north-south direction to ensure uniform light intensity.

D-5.3 Selection of Shade Nets Type

D-5.3.1 Nets transmits light evenly throughout the visible part of the light spectrum, thus acting as neutral density filters. Every plant has its own individual requirements for sunlight and shade under which it flourishes at its best. To create optimum climatic conditions, selection of the correct percentage of shade nets plays an important role under which the plant's productivity and quality produce is maximized.

D-5.3.2 There are no hard and fast rules for selecting shade nets type; it varies regionally, and according to prevailing climatic conditions in each region. Advice can be taken from the researchers, agricultural research bodies or from other successful growers in the region. In general, the geographical location of the site as well as the local climatic conditions can also play a role in determining the ideal shade nets requirements.

D-6 STRUCTURAL MATERIALS

D-6.1 A shadenets house consists of two basic components that is frame and cladding material. The frame (made of either G.I. pipes, steel, angle iron, wood or bamboo materials) provides support for cladding materials. The selection of frame materials must possess adequate strength to withstand the design loads. When deciding, for construction of shadenets house designers need to consider various design parameters particularly design loads such as wind load, crop load, live load and snow load for the selected design. Shadenets house can be of variable height and width.

D-6.2 Design Load

a) *Dead load* — Weight of all permanent construction, cladding, heating and cooling equipment, water pipes and all fixed service equipments to the frame.
b) *Live load* – Weights superimposed by use (include hanging baskets, shelves and persons working on roof). The shadenets house shall be designed for a maximum of 15 kg/m^2 live load. Each member of roof shall be capable of supporting 45 kg of concentrated load when applied at its centre.
c) *Wind load* — The structure shall be able to withstand winds of 120 km/h and at least 50 kg/m^2 of wind pressure.
d) *Snow load* — These are to be taken as per the average snowfall of the location. The shadenets house shall be able to take dead load plus live load or dead load plus wind load plus half the live load.

D-6.3 Depending on the costs involved in the construction, there are following three types of shadenets house:

a) *Low cost* — The low cost shadenets house is made of a supporting structure of bamboo/wood/local available materials. It does not have any climate control system but shall be equipped with micro-irrigation system.
b) *Medium cost* — The medium cost shadenets house is made of a supporting structure of G.I. pipes, profile springs and wires and equipped with micro irrigation system.
c) *High cost* — The high cost shade house is made of supporting structure of steel tubes and has many facilities like auto control mechanism, heating, cooling and humidification system, micro irrigation system etc.

D-7 COMMENCEMENT OF SHADENETS HOUSE INSTALLATION WORK

D-7.1 Before starting the shadenets house installation, the contractor shall issue a certificate of stability of erected shadenets structure, to enable to commence shade nets installation work.

D-7.2 Chain linked fencing shall be put around the shadenets house to prevent stray entry of men and animals to protect any damage to the shade nets.

D-8 SHADE NETS LAYING OPERATION

D-8.1 While laying the shade nets, precaution shall be taken to avoid any damage to it.

D-8.2 The shade house area shall be declared as a ‘NO SMOKING ZONE’.

D-9 SHADE NETS INSTALLATION OPERATION

D-9.1 Measure out about 25 percent more shade nets fabric than needed to cover the entire structure. Total requirements of shade nets depend entirely on the surface area of the shadenets house; as the area increases the requirement will decrease proportionally. It varies from approximately 2.5 times to 1.8 times of total surface area. Unroll the shade nets fabric across the structure, leaving at least one foot of nets fabric overhanging on all sides. Pull the nets fabric into position, straightening as needed.

D-9.2 Start with the longest side one will be covering and affix the shade nets fabric with appropriate measures like aluminium profile with zig-zag spring, etc. Keep the fabric tight and the lines on the knitting straight while working across the length of the structure. Same procedure need to be followed for shorter side by keeping the shade nets fabric evenly lined up while heading in the direction away from the home. Always continue in the same clockwise or counter clockwise direction one began with. When attaching the nets fabric, after finishing the last edge, try to avoid any overlap in the fabric.

D-9.3 Points Need to be Considered Before Installation

a) Before installation, carefully check the shade nets for any faults. Do not install shade nets with holes or any damaged area. Check actual length and width before starting the installation over the framed structure.
b) Twisting or shortage of the shade nets fabric on frame, structure or wall of the shadenets house shall be eliminated.
c) Metal parts shall not touch the nets. In the summer, heat accumulated in metal parts might damage the shade nets. Therefore, it is important to cover metal parts with white paint or white tape to protect the nets. Unprotected metal cables or metal parts are harmful to the nets and can cut it in matter of hours.
d) Friction between the shade nets and sharp edges of structures/hard surfaces in the construction shall be avoided.
e) Chlorine based products shall not touch the shade nets directly or indirectly. Chlorine and sulphur deteriorates the nets by chemical reaction.

D-10 POST INSTALLATION PRECAUTIONS

D-10.1 Shadenets house equipped with micro-irrigation and fertigation system increases production per unit area manifold and requires proper maintenance regularly. The frequency of services/examinations shall be in accordance to the extent of exposition of the shade house to hazardous conditions.

D-10.2 During the first two months of cladding of shade nets, it is very important to tighten them, whenever they become loose and to maintain a tight stretch of the nets. After the first two months, the natural spread of the nets is significantly reduced and stretching is required only once a year, or after harsh storms. This measure keeps the nets tight at a high level. This helps to prevent damage to the nets and extends its life span.

D-10.3 If no unusual events take place during the first year following completion of construction, it is necessary to conduct an examination of shadenets structure once a year. This examination shall be conducted prior to the season of strong winds and rain, as follows:

a) Verify the exposure of the columns from ground soil, if any. Conduct a random examination of the foundations; verify that they are intact. If there are cracks or damages, pour new foundations.
b) Verify that there are no tears or holes in the shade nets covering. Repair and fasten, if required.
c) Verify that there is no threat of flooding of the shadenets house as a result of any new groundwork conducted in the surrounding area adjacent to the structure.
d) Clean the shadenets house area from any debris that is likely to blow away and damage the structure of the shade nets covering.

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Technical Textiles for Agro-tech Sectional Committee, TXD 35

Organization	*Representative(s)*
The Synthetic & Art Silk Mills Research Association, Mumbai	Dr U. K. Gangopadhyay (***Chairman***)
Business Co-ordination House Pvt Ltd, New Delhi	Shri Samir Gupta Shrimati Ritika Gupta (*Alternate*)
Central Agricultural University, Imphal	Shrimati Mamoni Probha Borah
Central Institute for Research on Cotton Technology, Mumbai	Dr S. K. Chattopadhyay Dr R. Guruprasad (*Alternate*)
Central Institute of Plastics Engineering & Technology (CIPET), Chennai	Dr Abdul Kader Shri Rajiv Kumar Lilhare (*Alternate*)
Central Institute of Plastics Engineering & Technology (CIPET), Bhopal	Shri P. K. Sahoo Dr Ajay Kumar Neema (*Alternate*)
Chandra Shekhar Azad University of Agriculture and Technology, Kanpur	Dr Ashok Kumar Dr Jitendra Yadav (*Alternate*)
CTM Technical Textiles Ltd, Ahmedabad	Shri Amit Agarwal Shrimati Jyoti Agarwal (*Alternate*)
Department of Jute & Fibre Technology, Kolkatta	Dr Swapan Kumar Ghosh Prof S. C. Ray (*Alternate*)
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